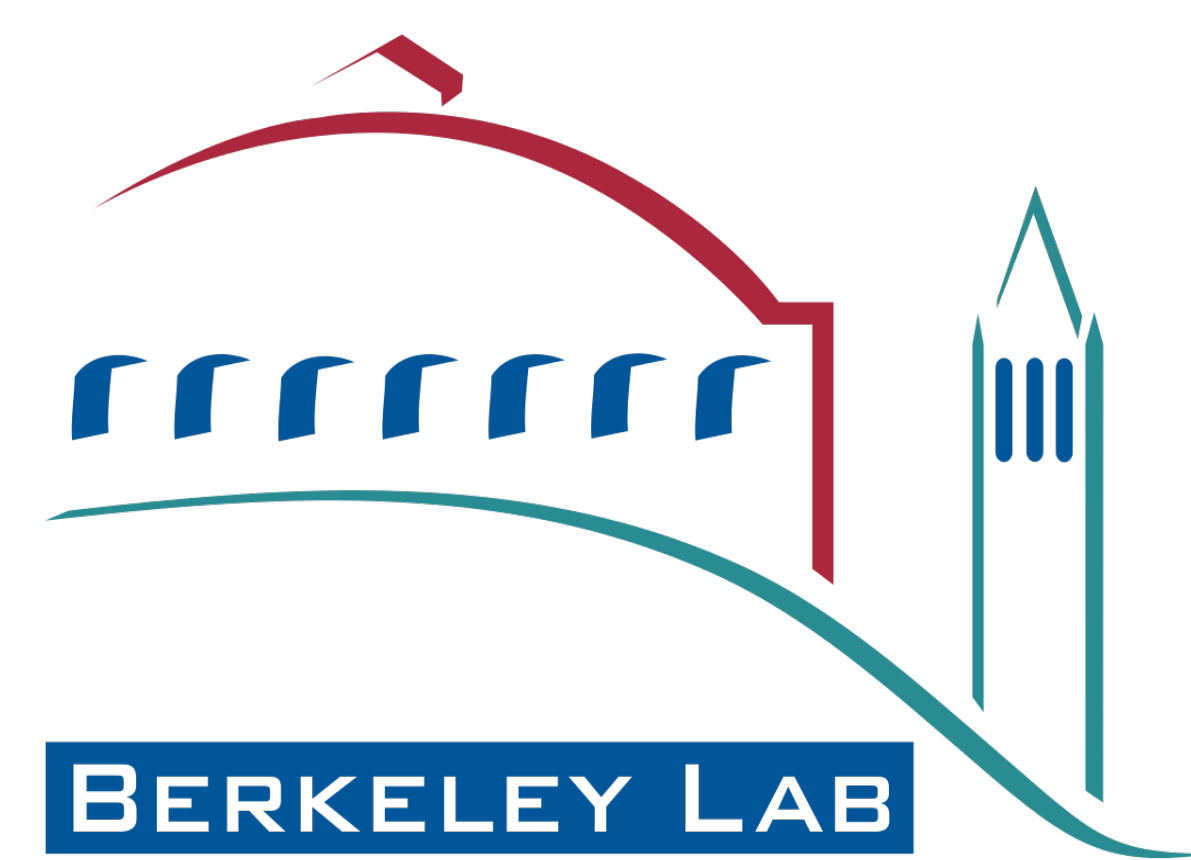




Non-prompt D^0 -meson production in Au+Au collisions at $\sqrt{s_{NN}} = 200$ GeV in STAR

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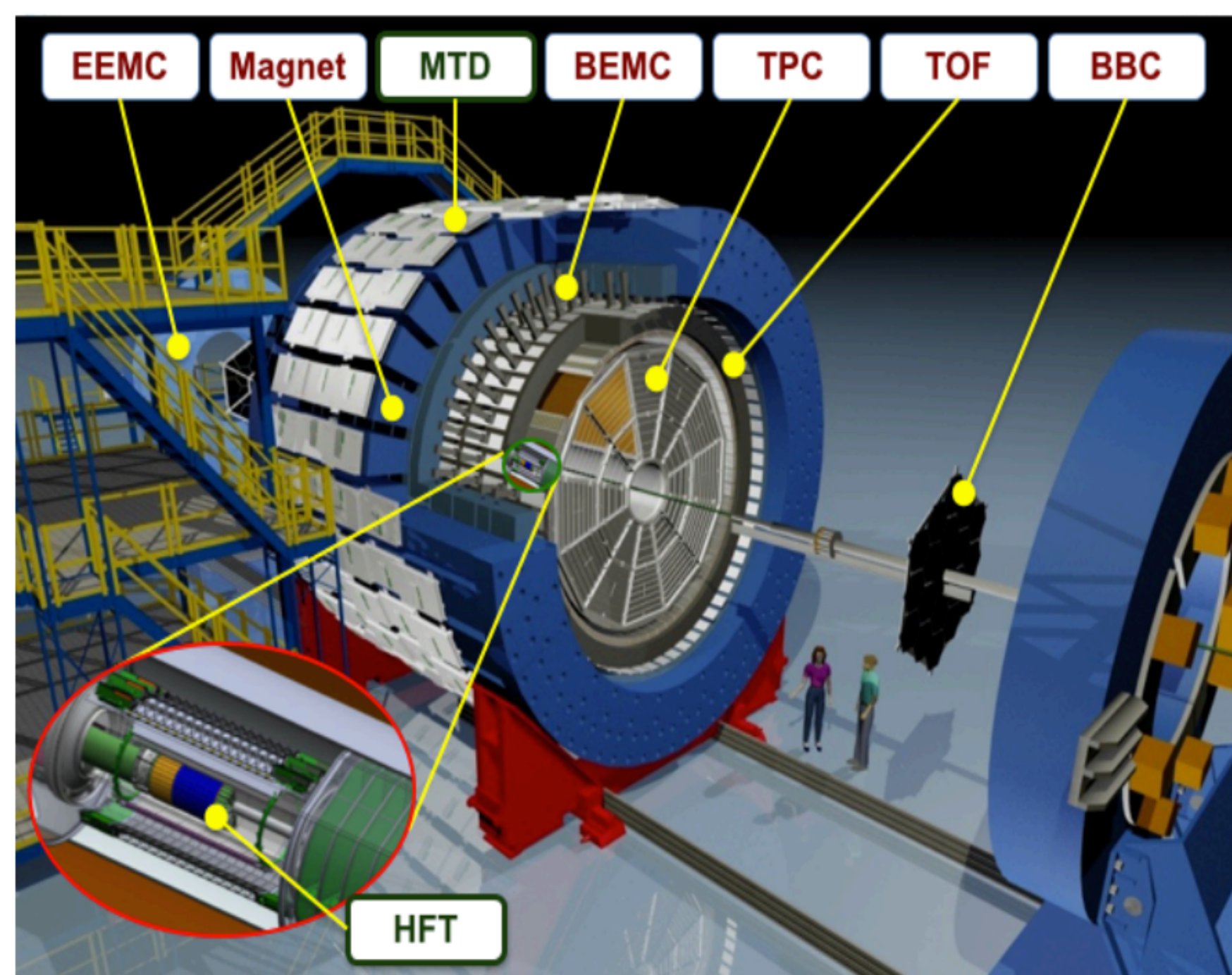


Abstract

Heavy flavor quarks (c , b) are produced dominantly by the interactions of the initial incoming partons, and thus experience the entire evolution of the hot and dense medium created in high-energy nuclear collisions. Systematic investigations of charm and bottom hadron production in heavy-ion collisions will shed lights into the understanding of the parton energy loss in the Quark-Gluon Plasma (QGP), which can help constrain the transport parameters of the QGP medium.

In this poster, we will present the first measurement of non-prompt D^0 -meson production from bottom hadron decays using the Heavy Flavor Tracker (HFT) in Au+Au collisions at $\sqrt{s_{NN}} = 200$ GeV by the STAR experiment.

STAR Detector



Time Projection Chamber

- $|\eta| < 1$, full azimuth
- Tracking, momentum.
- PID through dE/dx

Time of Flight

- $|\eta| < 0.9$, full azimuth
- PID through TOF
- Timing resolution: ~ 85 ps.

Heavy Flavor Tracker

- $|\eta| < 1$, full azimuth
- DcaXY resolution ~ 30 μm @ 1 GeV/c (p)

Inclusive D^0 signal in Dca bin

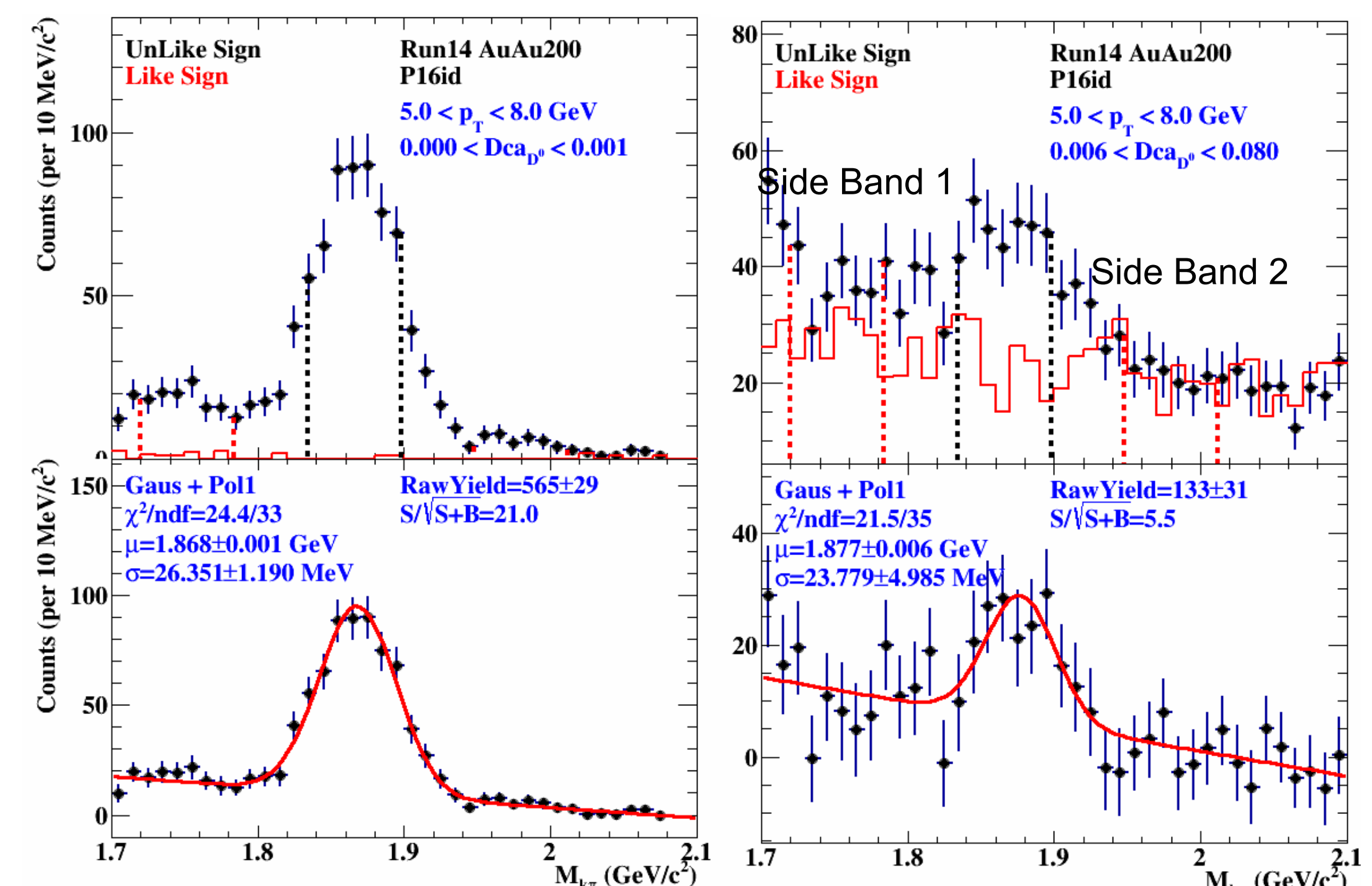
Total Events: 782M

Inclusive D^0 :

- 1) Prompt D^0
- 2) D^0 from B decay

Topology cuts

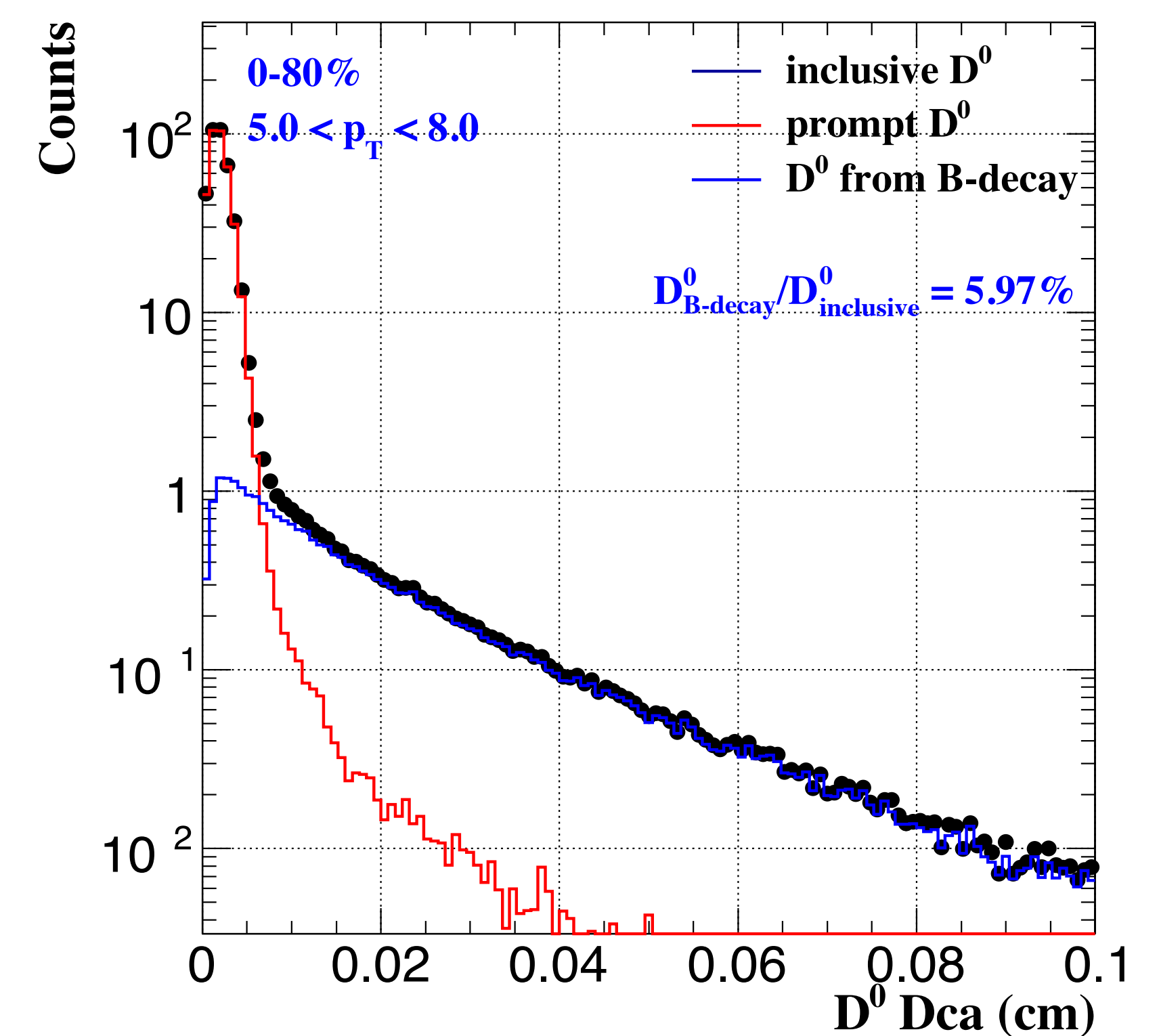
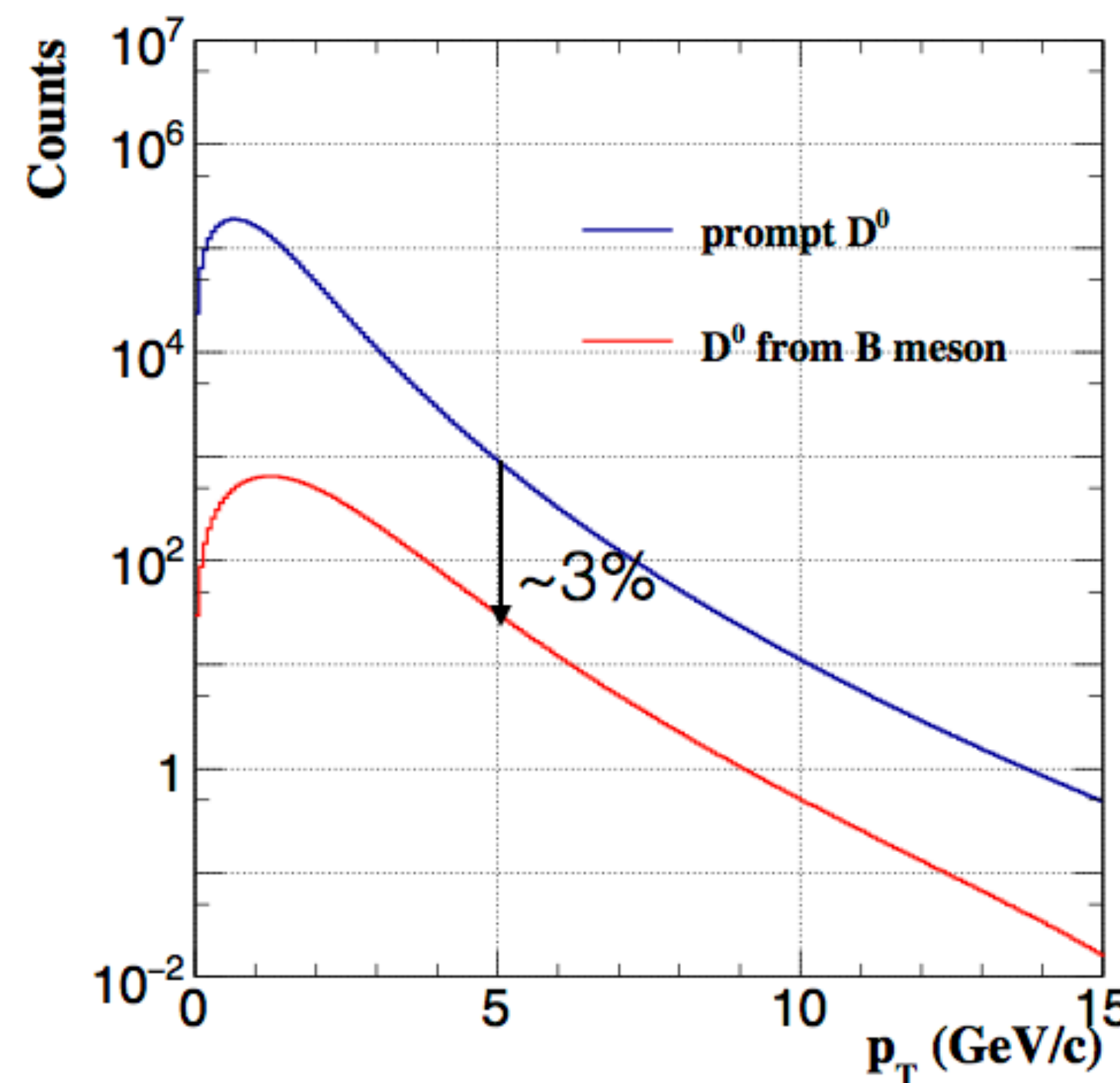
p_T (GeV/c)	3-5	5-8
DecayL (μm)	>247	>259
$\cos\theta$	>0.95	>0.95
Dca $_{K\pi}$ (μm)	<50	<60
Dca $_K$ (μm)	>79	>58
Dca $_{\pi}$ (μm)	>81	>62



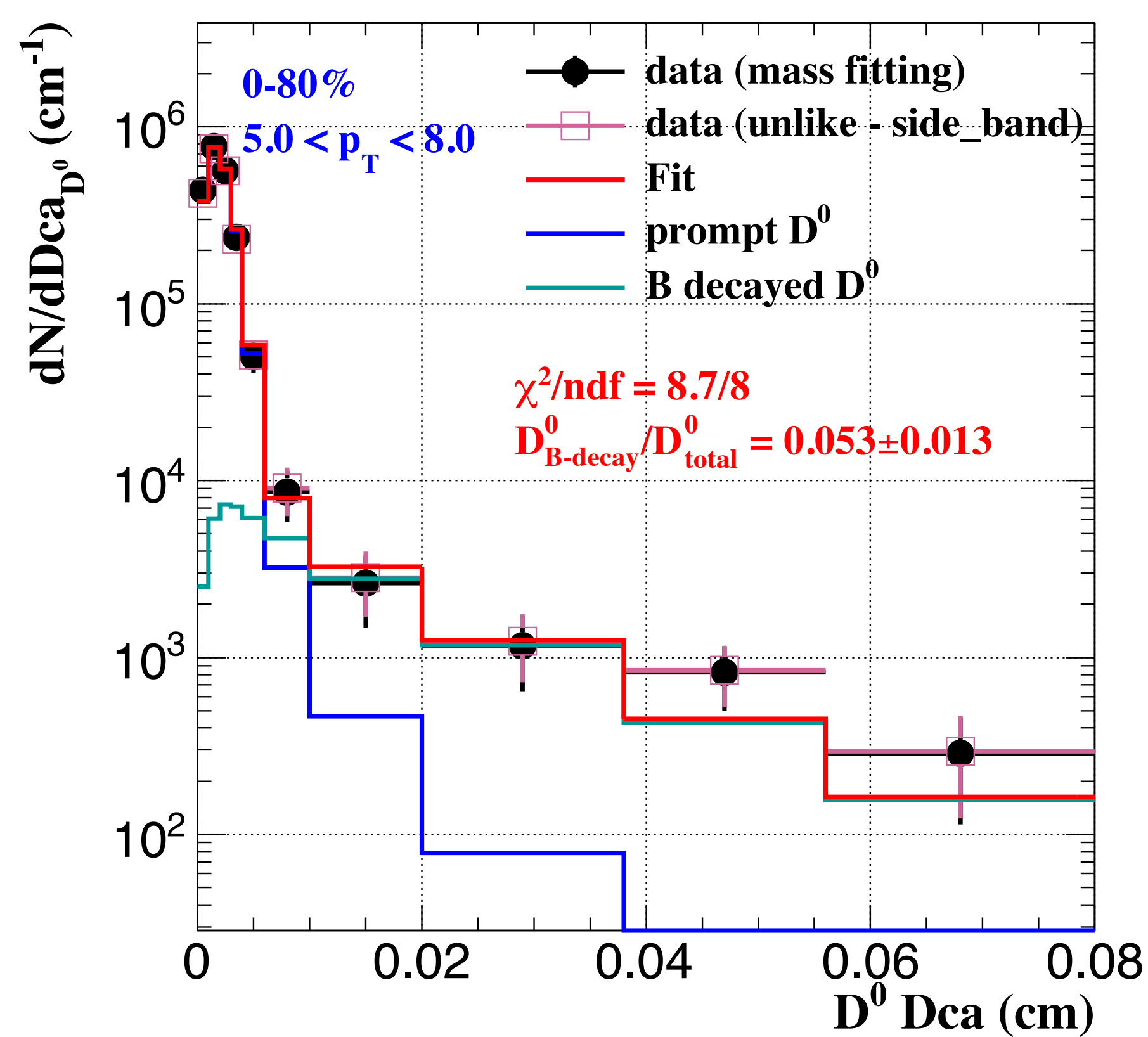
Simulation

- B-meson and D^0 -meson cross sections are fixed with FONLL
- Input numbers of B^\pm , B^0 and D^0 are scaled with fragmentation and branch ratio listed in the following table
- B^0 and B^\pm all channels decayed to D^0 are included (TPythia6)
- Include detector effects: HFT match ratio, dca smearing, momentum smearing, tracking efficiency.....

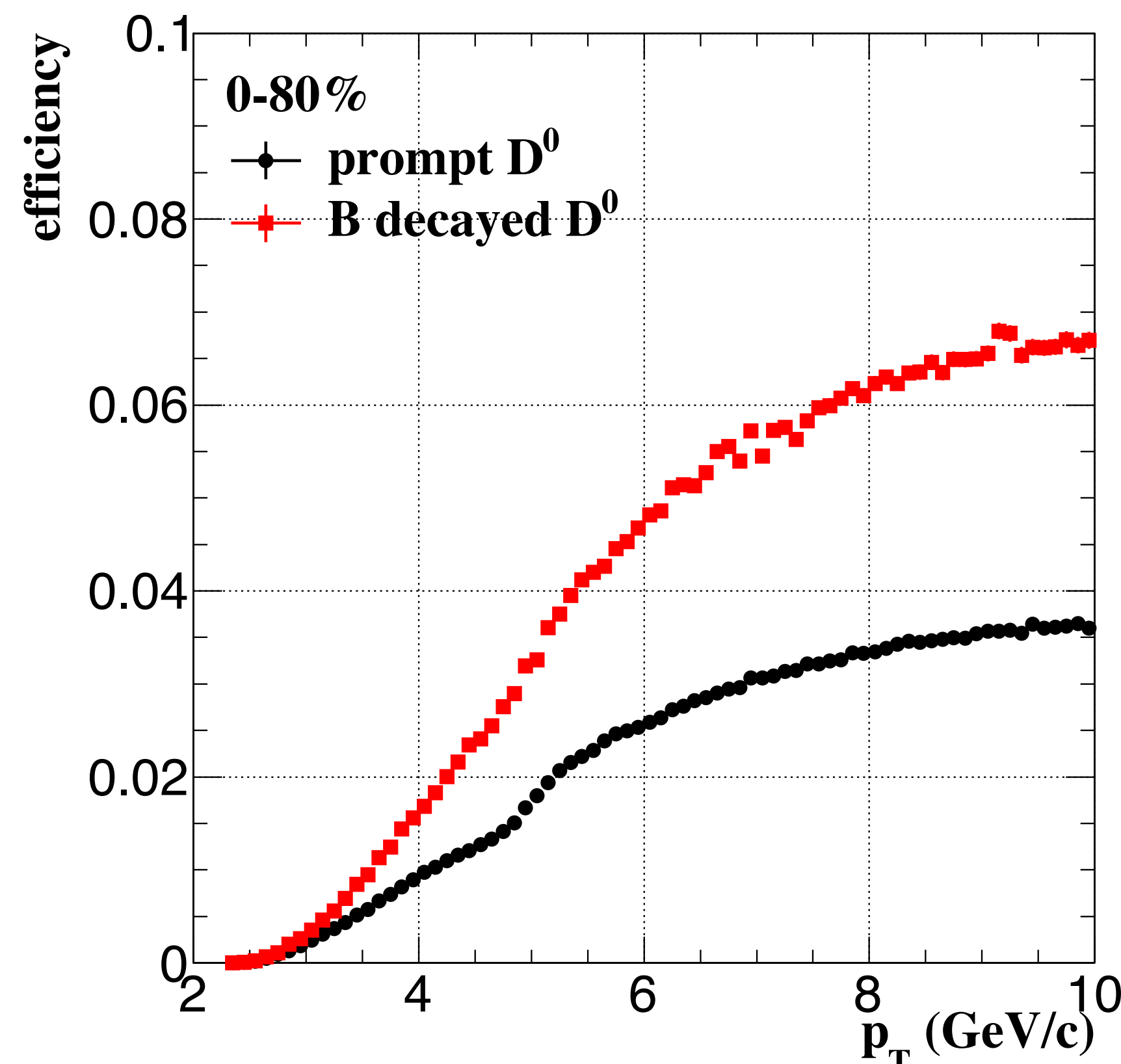
Particle	$c\tau$ (μm)	Mass (GeV/ c^2)	$q(c, b) \rightarrow X(FR)$	$X \rightarrow D^0(\bar{D}^0)$ (BR)
D^0	123	1.865	0.565	-
B^0	459	5.279	0.40	0.081(0.474)
B^\pm	491	5.279	0.40	0.086(0.790)



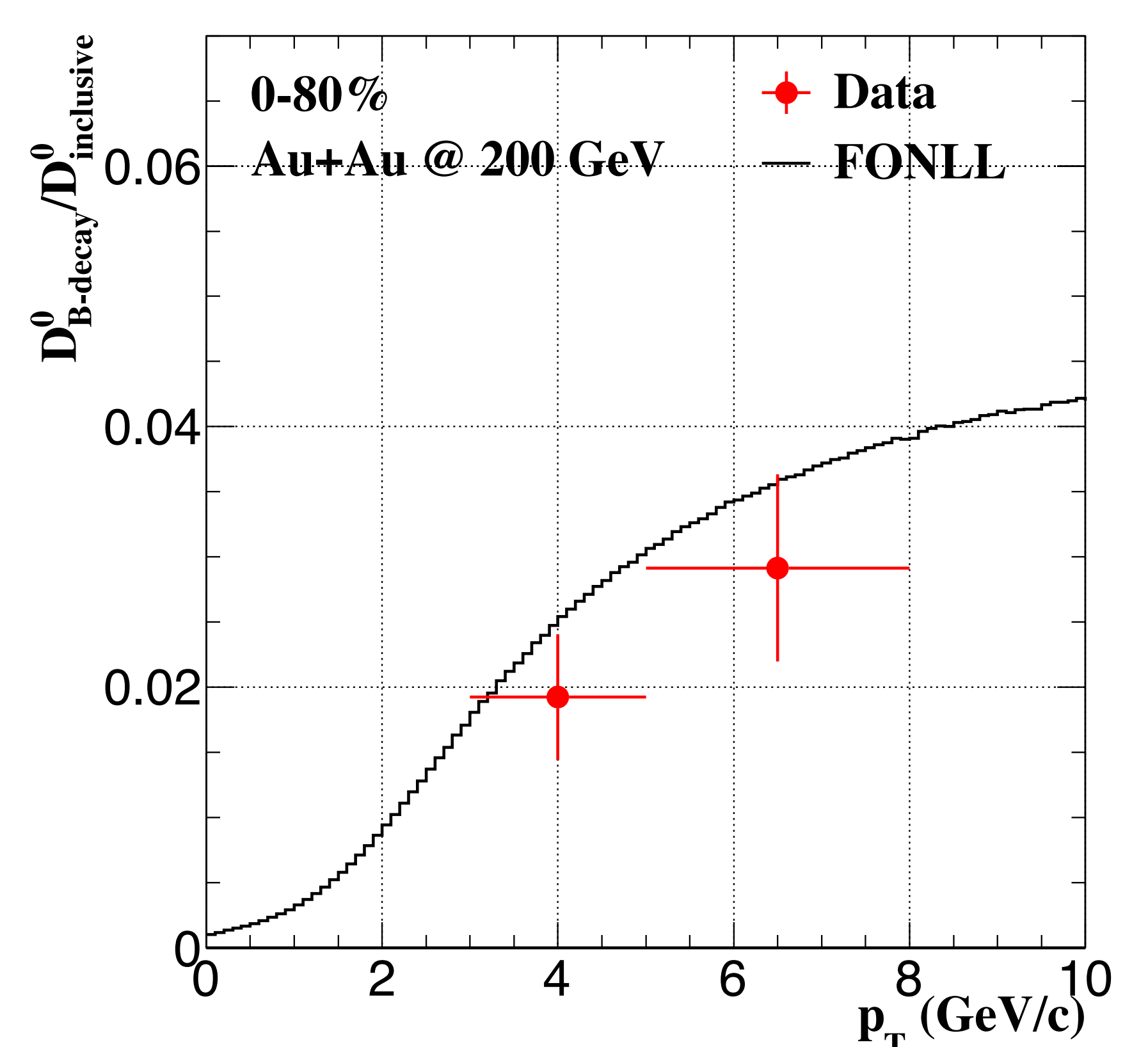
Template fitting



Efficiency



Non-prompt D^0 ratio



Summary

- 1) Non-prompt D^0 signal expected from bottom hadron decays is extracted in the transverse momentum region $3 < p_T < 8$ GeV/c
- 2) Non-prompt D^0 ratio is at $5 < p_T < 8$ GeV is 0.029 ± 0.007

Outlook

- 1) With STAR Run14+Run16 data, a factor of 4 statistics
- 2) Fast MAPS upgrade at STAR/PHENIX for precision bottom production